with the author's compliments

THE

MODERN PRACTICE OF MEDICINE:

A LECTURE

DELIVERED BEFORE

THE ROYAL COLLEGE OF SURGEONS.

BY

D. RUTHERFORD HALDANE. M.D., F.R.C.P.,

PHYSICIAN TO THE ROYAL INFIRMARY.

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THE MODERN PRACTICE OF MEDICINE.

Mr President and Gentlemen,—To endeavour, within the limits of a single lecture, to give a view of the present condition of the Practice of Medicine, might well be considered a presumptuous undertaking; and had I been called upon to address an assembly consisting exclusively of medical men, I should have hesitated to make the attempt. But as the audience which I have the honour of addressing embraces representatives of the other learned professions, I feel that I may be permitted to omit numerous details, and to confine myself to the consideration of those broader results which can scarcely fail to be interesting to every educated man.

The Practice of Medicine may be conveniently divided into three departments; there is, in the first place, that which inquires into the nature of disease, or Pathology; in the second, that which treats of the recognition of existing disease, or Diagnosis; and in the third, there is the division which comprehends the treatment of disease, or Therapeutics. Let us, then, inquire what is the present position of Pathology, Diagnosis, and Therapeutics, respectively.

Pathology has made extraordinary advances during the last half-century; this is to be ascribed principally to the systematic study of morbid anatomy; to the prosecution of microscopic researches; and to the cultivation of experimental physiology. The result has been that a new pathology has been elaborated, or is in course of elaboration. Accurate observation has modified and given precision to our views regarding inflammation and its results. A series of disorders has been traced to the impaction of minute particles of fibrine in distant parts of the vascular system. Much light has been thrown upon various obscure nervous disorders. Fevers, formerly confounded together, have been shown to be different in their causation, their symptoms, and their results. A whole group of diseases dependent upon what are called the degenerations, has been established. An accurate knowledge of the diseases of various special organs, such as the lungs, the liver, and

the kidneys, is being obtained. With such results as these, and I have only alluded to some of the most striking, it cannot be denied that the advance of pathology has been remarkable, and that its future prospects are most encouraging. Much still remains to do, but we seem to have obtained a solid foundation on which we may hope that a complete and permanent superstructure will be reared.

The progress of Diagnosis has been not less satisfactory. The great feature of the last forty years has been the introduction of what have been called methods of physical examination. By means of percussion and auscultation, we can distinguish with wonderful accuracy the conditions of the thoracic organs. The application of the microscope to the examination of the blood, of urinary sediments, and of various morbid products, has proved a source of much valuable information. Different forms of paralysis and other kinds of nervous disease can be distinguished from one another. There is, in fact, scarcely a disorder into the recognition and differentiation of which a considerable degree of precision has not been introduced.

But, important, nay, essential, as is a knowledge of Pathology and Diagnosis, it must be borne in mind that these departments are but means to an end. To cure disease and alleviate suffering is the object of the physician, and it is therefore to a consideration of the present condition and future prospects of Therapeutics that I propose to devote this lecture.

If we look back upon the progress of Therapeutics during the last fifty years, we shall find that its advances have been comparatively inconsiderable. Important improvements have no doubt been made, but these have consisted rather in the abandonment of time-honoured, but vicious methods, than in the introduction of new remedial measures. There can be no doubt that the system of bleeding and dosing was formerly carried to excess, and that the *nimia diligentia* of the physician was not unfrequently the most serious complication of the disease. For centuries the treatment of disease was almost purely empirical; and before a rational system of treatment could be established, it was necessary to prepare a pathological basis on which it could be founded. It has often been disputed whether Medicine is an art or a science. The fact appears to be, that like every pursuit which rises above the level of a handicraft, Medicine has a scientific and a practical side; the former embracing the theoretical principles on which its practical application is founded. In the absence of a scientific foundation, a sound practice is therefore impossible. The influence of pathology is only now beginning to make itself felt in the treatment of disease, and that influence has hitherto been manifested rather in indicating the uselessness or dangers of old practices, than in providing us with new methods of treatment.

A fundamental and most important principle of pathology has only lately been clearly recognised; it is this, that diseases

are not new and independent entities, but that they are perversions of normal or physiological processes. Formerly, when an inflammation manifested itself, it was regarded as something superimposed upon the organism; as an enemy attacking the fortress of life, which required to be repulsed by the most energetic measures. Its supplies must be cut off by the enforcement of a rigorous diet, and it must be attacked with the heavy artillery of bleeding, mercury, and blisters. But it was not kept in mind that by these measures the garrison was weakened in an equal degree with the enemy, or rather in a greater degree, so that even if the adversary were overcome or retired from the contest, the patient often succumbed owing rather to the severity of the treatment than to the malignancy of the disease. Now, however, we look upon inflammation and other diseases in a different light; we view them as perversions of normal states induced by the operation of some external or internal agency. We endeavour, therefore, to put the part or the system in the most favourable circumstances for the resumption of its physiological condition.

The importance of the *vis medicatrix naturæ* has long been recognised, but it is only lately that the physician has ventured to repose much confidence in it. By the expression *vis medicatrix* we mean that when disease exists, there is generally a tendency to spontaneous recovery. Thus, when symptoms of a specific fever manifest themselves, we believe that they are due to the introduction into the system, and the subsequent multiplication of a morbid poison. The result is a disturbance of the organism, which endeavours to eliminate the poison, the presence of which is incompatible with a healthy condition of the body. If the poison prove too strong, death ensues; but if, as generally happens, the powers of the system are sufficient, the poison is eliminated, and recovery takes place. The object of the physician in the treatment of fever should, it is now recognised, be exactly the same as in the case of poisoning by an ordinary toxic agent. His first endeavour should be to get rid of the poison before the system has been brought under its influence; this, however, he cannot do. He rarely knows that the poison has been introduced until its effects upon the system have declared themselves. Besides, he is ignorant of the channel by which it has entered, and he therefore does not know in what manner to apply his remedies. Failing this, he should endeavour to neutralize the poison, to render it inert. But, as the nature of the fever poison is still unknown, he cannot give antidotes, which he can often do successfully in the case of the ordinary poisons. It only remains for him, therefore, to preserve the system as far as he can from the effects of the noxious agent; to favour nature in her endeavours to eliminate the poison; and to help her to get rid of excrementitious matters, the retention of which within the organism would be a source of additional danger. This, no doubt, may seem a comparatively humble office, yet, it is of no mean importance.

The old maxim used to be "starve a fever." Excellent treatment if it could be directed against the fever only! but, unfortunately, the patient was too often starved in the process. Dr Graves, to whom Medicine is much indebted for the introduction of a rational dietary in the treatment of fever, when going round his convalescent ward one morning, and expatiating on the healthy appearance of some who had recovered from severe typhus, remarked to the students who accompanied him, that it was all the effect of good feeding; "and lest," said he, "when I am gone, you may be at a loss for an epitaph for me, let me give you one in three words:—

"HE FED FEVERS."

This feeding of fevers, and indeed of other diseases, is one of the greatest improvements in modern therapeutics; and now our wonder is that the practice should ever have been different. In health, a constant waste of tissue is going on, which must be made up by the introduction of new material, that is, by food. In fever, this waste goes on far more energetically than in health, as is evidenced by the rapidly advancing emaciation. In addition, a poison is circulating in the blood, disordering every function, and tending to cause death by its depressing effects upon the nervous system. We are now satisfied that it is irrational to combat such a condition by the withdrawal of food, which, if necessary in health, must be doubly so when the body is exhausted by disease.

At present, therefore, it would appear that the physician rather endeavours to put his patient in the most favourable condition for recovery, than that he attempts actually to *cure* disease. The instances in which the physician attempts to cure are few; and in these cases, even when his treatment is successful, he cannot tell *how* it has acted, because he has prescribed it empirically. The best example we have of the cure of disease, is the success which generally follows the use of quinine in intermittent fever, but of the mode of operation of the remedy we are ignorant, and the use of the drug in continued fever, founded upon a presumed analogy between the two diseases, has proved unsuccessful. The physician has, however, a twofold duty to perform. His first endeavour should be to arrest death, failing this, he must do his best to relieve suffering. With the latter object before him, he is often called upon to treat symptoms, although he may be ignorant of the essential condition of the abnormal state on which they depend. Pain, sleeplessness, cough, and various other symptoms he is often enabled to relieve, and in doing so, he sometimes makes an impression upon the actual disease.

To sum up, therefore, I would say that the present state of the Practice of Medicine is this:—The physician seldom attempts to *cure* disease; he endeavours to place and maintain his patient in the most favourable condition for recovery; and he treats symptoms, although he often does not know on what they essentially

depend. "Restorative medicine" is a favourite expression in the present day; and no doubt it is a great improvement upon the systems of practice which have preceded it. But I shall presently endeavour to show that restorative medicine is not enough, and that the physician must hold out to himself a loftier aim, which there are good grounds for believing he may be enabled to attain.

The question now arises: how has this great change in the Practice of Medicine been brought about? The answers which have been returned have given rise to much controversy, and opinion is still divided in regard to it. Some maintain that the change in practice has resulted from a change in the character of disease; they assert that diseases are of a less sthenic type than formerly, and that the severe depleting treatment previously enforced was judicious at the time, although in the present day it could not be borne. Others are of opinion that disease is the same now as it ever was, and that the change in practice has been the result of the advances of pathology and diagnosis. I do not think, however, that either of these answers furnishes a satisfactory solution of the question.

That a certain change in the type of disease has taken place, I believe to be probable, although I do not think that this explains entirely, or even to any great extent, the change which has occurred in practice. Even at the time when the antiphlogistic regimen was most strictly enforced, there were practitioners who maintained that such treatment was injudicious, and that it was more likely to weaken the patient than to cut short the disease. On the other hand, Bouillaud, one of the few living representatives of the old style of practice, laughs at the idea of a change of type, and goes on bleeding *coup sur coup*, with the same heroism as formerly. Various causes have doubtless concurred to bring about a certain change in the human constitution, at least in this and other civilized countries. Towns have increased disproportionately to the general increase of the population, and the tendency is still to the crowding together into vast centres of masses of inhabitants. Employments are probably on the whole more unhealthy than formerly, at least many persons have been taken from rustic pursuits, and out-of-door labour to work in manufactories and warehouses, which are often unhealthy in consequence of deficient ventilation, floating particles of dust, or the disengagement of noxious fumes. A change has taken place in the food of the people; tea and coffee have to a great extent taken the place of milk, meal, and other highly nitrogenized articles, and although the food of the population has on the whole decidedly improved, this amelioration has not been universal, and has been accompanied by certain disadvantages. The use of tobacco has increased to such a degree, that an influence upon the health of the community cannot but have been exerted. Finally, the world is far busier than formerly; competition was never so keen as it is at present; the minds of whole classes of the community are kept in a state of continual tension;

wealth has increased, and luxurious habits have augmented in at least a corresponding ratio.[1]

These various influences have, on the whole, had a debilitating effect, and it seems fair to conclude that a certain change has been produced upon the character of disease. But, I do not think that the change has been by any means so considerable as to account for the revolution which has taken place in practice. Poets have always been prone to sing of the comparative degeneracy of their own day; but the most enthusiastic of the *laudatores temporis acti* never dreamt of such a deterioration in constitutional power as some would have us to believe has taken place within the last generation. A complete change in the type of disease without adequate causes to account for it, seems *à priori* improbable. The study of medicine would become a really hopeless pursuit if we could suppose that diseases could so change their character, that treatment which yesterday was judicious, should to-day be useless or injurious. It is chiefly in regard to bleeding that there is said to be an intolerance in the present day; but the same might as well be asserted of blistering. Blisters are now applied far less frequently than formerly, but I doubt whether the warmest supporter of the change-of-type theory would seriously maintain that their use has been comparatively discontinued because they do not produce the same good effects as formerly, or because they exert too powerfully depressing an influence upon the constitution.

That the recent advances in Pathology and Diagnosis have had something to do with the change in practice, I fully believe; although, I consider, that these alone are insufficient to account for it. Indeed, I think that the change had begun independent of Pathology, and though Pathology has done much to foster, it cannot be said to have initiated it. I think we must in great part refer the change which has taken place in treatment to a more general cause than has hitherto been assigned for it.

During the present century, a great change has come over the current of ideas and the course of public opinion. A spirit of independent inquiry has gradually been aroused. Doctrines, which had maintained their ground for ages, have been rudely assailed, and have in many cases been cast aside. There is no department of knowledge which has not been affected by this spirit. The History of Greece and Rome, accepted without question for centuries, has been subjected to a scientific criticism, and many of its most romantic portions have been shown to be little more than fables. The dogmas of Theology no longer obtain that unhesitating assent which they formerly commanded, and we see the minister of religion compelled to give serious consideration to the objections of the man of science. Even the most uncompromising maintainers of the inspiration of the Scriptures now admit a latitude in the interpretation of passages, which not long ago would have been

[1] See *Health and Disease*, by Dr Edward Smith, p. 373, *et seq.*

sternly refused. In Art, we have seen a school of painting arise which, rejecting all authority, has refused to be guided by the example of the great masters, and has declined any teaching but that of nature. It would have been strange had Medicine escaped the influence of this tendency; in fact, there were special reasons why this could not have been the case. An incorrect Pathology, handed down in various forms from generation to generation, had impressed on medical practice a needless severity. Treatment was too lowering; medicines were given in much too great quantity, and often in very unpalatable forms; while the physiological effects of large doses of active drugs were anything but agreeable. It was therefore not surprising that, in the existing state of public feeling, a reaction should have taken place. Everything was ripe for a change, and, as usually happens, the wave of public feeling seemed about to pass over to the other side. A new system of treatment, based upon a principle having a certain degree of plausibility, and professing to cure diseases by the administration of infinitesimal doses of medicine, was announced, and soon attracted a large body of adherents. Now, although the results of this system were enormously and often dishonestly exaggerated, enough remained to satisfy both the public and the medical profession that, under the influence of diet and regimen, recoveries took place from maladies which had hitherto been supposed to require energetic treatment. On neither side was the lesson thrown away. The public declined to be dosed with the same assiduity as formerly. The reflecting physician saw an important experiment performed before his eyes, which taught him that nature when placed in favourable circumstances was equal to the cure of various diseases. Another circumstance which tended to shake the practitioner's confidence in drugs, was the increasing attention paid to morbid anatomy. It was found that organic disease was far more frequent than had been supposed, and the physician could scarcely hope to find remedies which should exert any influence upon parts which had undergone important material changes. Not unnaturally, this produced in his mind a feeling of despondency, for he did not bear sufficiently in mind, that on the dissecting-table he did not see disease itself,—he only witnessed its results; that he found the organs in a condition which had proved incompatible with the life of the individual,—a condition over which medicine could be expected to exercise but little control.

The result of these and other causes has been, that in many minds a scepticism regarding the value of all medicine has been engendered, and that the treatment of disease has in some quarters degenerated into pure expectancy. Those who have faith in the efficacy of remedies must allow that the Practice of Medicine is at present in a transition state; it has been going through a phase through which it was necessary that it should pass; but we have a right to expect that it shall vindicate for itself a position more

exalted than that which it at present holds. Accordingly, I now proceed to inquire whether it is not reasonable to expect that Medicine may ultimately acquire the power of *curing* many diseases.

I may at once state my belief, that if this power is ever to be attained it will be by the discovery of agents which shall act in a specific manner upon the different tissues and organs of the body. Here, however, I must remark, that I do not use the term *specific* in the sense in which in Therapeutics it is generally employed. When we say that quinine is a specific in ague, or that lemon-juice acts specifically in scurvy, we mean that these agents act upon the system in some unknown manner and overcome the disease. We may indeed theorize as to their *modus operandi*, but what it is we do not know, and our only warrant for employing them is, that experience has shown that in certain morbid conditions their curative powers are to be depended upon. It is not with this meaning that I here use the term specific,—which, indeed, in the instances I have alluded to, is much the same as empirical,—but I employ it in a physiological and strictly scientific sense. When I say that I hope to see the introduction of specific modes of treatment, I do not mean that we should spend our time, most probably fruitlessly, in a search after drugs which shall exert a mysterious curative influence on disease, but that we should seek for and discover remedies which shall act in a specific manner upon the organism, and which shall modify the nutrition and the functions of particular parts. One of the greatest improvements in Pathology is, as already stated, the recognition of the principle that diseases are not distinct entities, but that they consist in the perversion of normal vital processes. If, then, we can modify in a definite manner the nutrition of the part or organ which is the seat of the abnormal process, it is evident that we shall have made an important step in our efforts to relieve it.

But to prove that such a scheme is not Utopian, and that we may fairly anticipate the introduction of such a method of treating disease, I must now endeavour to show that many facts in physiology clearly indicate that specific affinities exist between certain organs and certain substances.

My first illustration of the truth of this doctrine may be derived from what is known of the history of nutrition. Everything leads us to believe that specific affinities exist between the tissues and the circulating fluids. The capillary circulation is carried on, or at least is materially assisted, by the existence of these affinities or attractions. Unless the blood be in a healthy condition relatively to the tissues, and unless the tissues be in a normal state relatively to the blood, retardation or stagnation takes place. The much-contested cause of the stagnation of the blood in an inflamed part appears to be that the tissues have been put in an abnormal condition in consequence of the operation of an irritant, and the healthy relation which should exist between them and the blood has been

disturbed. On the other hand, in asphyxia, the blood stagnates in the capillaries of the lungs because, from the deficiency of oxygen, it has not been freed from carbonic acid, and therefore no longer bears its normal relation to the pulmonary textures.

Again, all the tissues of the body are nourished, directly or indirectly, by the blood. The composition of the blood is essentially the same in all parts of the body; yet, tissues having the most various chemical composition, derive their nutriment from it. The brain requires a regular supply of phosphorus and fats; the muscles require albuminous materials and salts of potash; the bones require phosphate of lime; the hairs require a small quantity of iron. Every organ is constantly undergoing disintegration, and unless the loss be as constantly supplied, the integrity of the part would suffer. To provide for this continuous waste of material is the purpose of healthy nutrition; and as all must be derived from the blood, we can only suppose that it is because certain organs have a peculiar affinity for substances which enter into their composition, that these are deposited in particular situations. We can explain this selection in no other way than by saying, that the power of extracting from the blood what is necessary for its support, is an inherent property of living tissue.

The same principle is illustrated in the case of secretion. The purpose of secretion is either to purify the blood by the removal of materials which have served their purpose, and have become useless and deleterious, or to provide substances which shall have an active part to perform in the processes of nutrition. The secretions of glands, the structure of which is apparently much the same, are very different. The renal and hepatic cells do not differ very widely; yet, how different is the urine from the bile. The peculiarities in the secretions of the various glands cannot be explained by any difference in the arrangement of the bloodvessels; we are therefore led to look to the epithelium as the essential element upon which the activity of the gland depends. And we can only conclude, that the healthy epithelium of the different glandular structures exerts upon certain materials contained in the blood an elective affinity or attraction in virtue of which they are withdrawn from the circulating fluid. This doctrine of the affinity of the glands for particular elements holds good, not only when all is going on regularly, but is even more strikingly illustrated when certain foreign substances are taken into the body. Salts, when introduced into the stomach are, if soluble, absorbed and eliminated by different channels. The special channels by which they are eliminated vary according as there is a special affinity between the substance introduced and particular glands. Some substances appear capable of being eliminated by all the glands of the body; thus, if iodide of potassium be swallowed, it may be detected in all the secretions, in the saliva, the urine, the pancreatic juice, and the bile. Yet, even here, all the glands do not stand in precisely

the same relation to it; iodine being more readily given off by the salivary glands than by any other secreting apparatus in the body.[1] The channels for the elimination of other substances are often more limited. Yellow prussiate of potash, for instance, is not given off by all the secreting organs. It is eliminated freely by the urine, in less quantity by the gastric juice, while it cannot be detected at all in the saliva. Iron, again, is seldom found in the secretions. When administered internally it is absorbed, though in extremely small quantity; sufficient, however, is taken up to modify, either directly or indirectly, the constitution of the blood. The whole, however, of what is absorbed is not retained in the blood, it cannot become accumulated beyond very narrow limits, and it has been a question by what channel it is eliminated. Recent observations have shown that it is given off by the bile, which appears to stand in a close relation to the colouring matter of the blood.[2] In these and similar cases we must suppose that specific affinities exist between substances introduced into the body and certain secreting organs, in virtue of which affinities the channels for the elimination of the foreign material are determined.

The same principle is illustrated, if possible in a more striking manner, in the mode of action of various poisons. Poisons may act in one or other of two ways. Those which are very prompt and energetic in their action appear to produce their effects upon the nervous system; those, again, which operate more slowly seem to act by modifying the nutrition, and thereby producing abnormal conditions of other parts of the body. In either case, however, (except in the case of those poisons which act chemically), it is necessary that the toxic agent be absorbed into the blood. Those poisons which, when taken into the blood, act most energetically upon the nervous system, produce no effect when directly applied to it. Prussic acid when swallowed, or when placed upon the conjunctiva, kills almost instantaneously; it has, however, been applied with impunity to the denuded brain of the horse. Not only must poisons be absorbed into the blood, they must, to produce their effects, pass into the arteries in order that, through the medium of the capillary circulation, they may be brought in contact with the elements of the tissues. The poisonous properties of sulphuretted hydrogen are well known; it is said to prove fatal when respired in the proportion of one eight-hundredth part. The gas is absorbed into the blood from the air-cells of the lungs, passes into the arteries, and produces its toxic effects upon the brain. When introduced by another channel, so that it has an opportunity of being eliminated before reaching the arteries, it may, however, prove innocuous. Water containing a large proportion of it may be drank with impunity; and it is related of a chemist who had a

[1] See Claude Bernard, Leçons sur les Propriétés Physiologiques, etc., de Liquides de l'Organisme, tome i. p. 447.

[2] Claude Bernard, *loc. cit.*, p. 448.

predilection for this substance, that he was in the habit of drinking a saturated solution of it. In this case the gas is absorbed by the veins of the stomach and intestines, passes into the vena porta, then into the inferior vena cava, thence into the lungs, by which it is so completely eliminated that none remains to pass into the arteries and produce injurious effects upon the brain.[1]

Seeing, then, that poisons do not in general act locally, but that they must, to produce their effects, be absorbed into the blood, let us now endeavour to discover whether their mode of action is not regulated by specific affinities which exist between them and certain parts of the body. Beginning with the poisons which act most rapidly, let us take woorara, strychnia, sulphocyanide of potassium, and nicotine, and inquire whether we cannot, by the aid of experimental physiology, discover what are the special parts of the system which they affect.

The *Woorara* or *Woorali poison* is employed by certain native tribes in South America for poisoning the arrows which they use, either in war or in the chase. It is harmless when taken into the intestinal canal, but is a most deadly poison when introduced into a wound. The following are the phenomena which characterize its action:—Shortly after the introduction of the poison the animal falls down, apparently without suffering, and without uttering any cry; occasionally, though not generally, slight convulsions show themselves. The conjunctiva is at first sensitive, and when it is touched the eyelids close; the animal, however, soon loses the power of closing the eyes, although the sensibility does not appear to be abolished. The pupils dilate, the sphincters become relaxed, and the respiration ceases. The animal is now apparently dead, but the heart goes on beating and continues to do so for two or three minutes, when the contractions become weaker and gradually cease. During the period while the heart goes on beating, it is impossible to produce any reflex movement. When the body is opened, the blood is found black from imperfect oxygenation. The poison has proved fatal by abolishing the respiratory movements. When galvanism is applied to the nerves, no movements of the corresponding muscles are elicited; reflex actions we have seen are abolished; but the muscles retain their properties, for, when directly galvanized, they contract. Now, the action of this poison is absolutely confined to the nervous system; but we can go farther, and say that it acts exclusively upon the motor nerves, and that it kills by paralyzing the muscles of respiration. The heart goes on beating after motion in the other muscles has been abolished, because its movements do not stand in the same relation to the nervous system; finally, it stops, in consequence of failure of the respiration; but if artificial respiration be kept up for a sufficient time, the effects of the poison go off, and the animal recovers.[2]

[1] Claude Bernard, Sur les Effets des Substances Toxiques, p. 57.
[2] Ibid., p. 305, *et seq.*

Strychnia, the chief active principle of nux vomica, is well known as a violent poison. When introduced by any channel into the body, the animal speedily becomes rigid, or is thrown into violent convulsions. Death occurs either during a tetanic spasm, or is due to asthenia, and in the former case appears to be the result of asphyxia, occasioned by rigidity of the muscles of respiration, and their consequent inability of movement. The mode of action of strychnia is peculiar; it does not act as a direct excitant of the nervous system, but it exaggerates excessively the reflex functions of the spinal cord, so that the slightest irritation produces violent tetanic convulsions. And it appears to produce the augmentation of the vitality of the spinal cord in two ways,—1*st*, By increasing the amount of blood in the spinal cord, by paralyzing the muscular coats of the vessels which supply it; and, 2*d*, By acting in a special manner on the tissue of the cord.[1]

When *Sulphocyanide of Potassium* is injected into the cellular tissue of an animal it speedily becomes paralyzed, the action of the heart ceases, and if the dose of the poison have been small, voluntary motions may be observed, even after cessation of the contractions of the heart. Artificial respiration has no effect, because paralysis of the heart has been occasioned by an influence exerted directly upon itself. This is the reverse of what we saw to be true in the case of woorara, and experiment has proved that sulphocyanide of potassium destroys by contact muscular irritability, and that it does not affect, at least directly, the nervous system.[2]

The last of the poisons which I mentioned was *Nicotine*. This alkaloid, derived from tobacco, is one of the most deadly poisons known; a few drops placed in the eye of an animal kill it almost instantaneously. When the foot of a frog is examined under the microscope, the circulation is seen going on in the well-known manner; if now the animal be poisoned by nicotine, the arterial system becomes immediately emptied, in consequence of powerful contraction of the coats of the arteries. The heart, however, continues to beat, and the stoppage of the circulation seems the result of an effect produced upon the bloodvessels themselves. The explanation of this phenomenon is to be found in the result of experiments performed upon the sympathetic nerve. When the sympathetic is cut in the neck, the parts supplied with branches from it become the seat of a more vigorous circulation, in consequence of the coats of the bloodvessels which had been paralyzed by the section of the nerve becoming dilated and allowing more blood to pass through them. If, on the contrary, the cut end of the sympathetic be galvanized, an opposite effect is produced,—the circulation in the part is diminished, because the coats have contracted under the application of the stimulus, and the calibre of the vessels has consequently been diminished. This second effect is precisely what is produced

[1] See Brown-Sequard, Lectures on the Principal Forms of Paralysis of the Lower Extremities, p. 50.

[2] Claude Bernard, Sur les Effets des Substances Toxiques, p. 350.

by nicotine; and, accordingly, it seems highly probable that the fatal effects of that poison are due to an action on the great sympathetic, and, through it, on the vascular system.[1]

Here, then, we have four of the most deadly poisons which prove fatal by acting on the nervous system, but in which the phenomena and the mechanism of death are essentially different. Are we not, then, justified in believing that each of them has acted upon a different part of the nervous system?

We see the same tendency to localization in the case of those poisons which do not act so much through the nervous system as on the structure of the organs themselves. We know, for instance, that arsenic acts upon the stomach, through whatever channel it is introduced. Mercury, whether swallowed, inhaled, or introduced by inunction, exerts a peculiar effect upon the mucous membrane of the mouth, and on the salivary glands. Lead produces a peculiar form of paralysis, by injuriously modifying the nutrition of certain muscles.

The last source of evidence to which I shall refer is derived from what we see in the case of the storing up within the body of certain metallic substances. It is well known that some poisonous substances may remain in the body for a length of time, without giving rise to any markedly injurious effects. We must suppose that they have formed insoluble compounds, and that, as they can no longer find their way into the arterial circulation, their poisonous properties cannot be exerted. And accordingly, if they again become soluble, poisonous effects again manifest themselves. But such substances are not stored up at random within the body. Certain organs have a peculiar affinity for certain substances, and in virtue of this affinity the particular substance finds its way to a definite locality. Thus, arsenic has a peculiar affinity for the liver; lead, for the liver and muscles; mercury, for the bones. When nitrate of silver has been taken for a length of time, it occasionally produces a peculiar form of discoloration of the skin, in consequence of the metal having been deposited in its tissue; in rarer cases a similar deposit is found to have taken place in the kidneys, in the form of a blackish-blue coloration of the membrane of the coils of vessels in the Malpighian tufts, and in the intertubular stroma of the medullary substance.[2]

I have thus endeavoured to show, from a variety of considerations, that specific affinities exist between particular substances and certain parts of the organism, and that these affinities may be the means of exerting an important influence upon the nutrition of the part. We are, therefore, justified in believing that the same principle holds good with regard to medicines generally; and a necessary corollary from this is, that medicines, to manifest their full energy, must be so administered as to exert their influence upon particular organs. I believe that the carrying out of this principle

[1] Claude Bernard, *loc. cit.*, p. 399.
[2] Virchow, Cellular Pathology, p. 213.

will exert a most important effect on the progress of Therapeutics. Instead of acting upon the system as a whole, we wish to concentrate our treatment upon the diseased locality. We all know how much more efficacious is topical than general treatment, when the former is possible. At present, in treating pneumonia, we combat diseased action in the lungs by means which only affect these organs in common with the whole system; but if hereafter we discover an agency which acts specifically upon the lungs, it is evident that we shall not only act more powerfully upon the seat of the disease, but that we shall save the general system from unnecessary interference. Suppose we were endeavouring to put out a fire in an isolated chamber, whether would it be better to fit up fire-engines on the outside, and play upon the building until we had inundated it completely, or to enter the apartment, and with a single well-directed bucket of water, succeed in extinguishing the still limited conflagration?

I am aware that it may be by many regarded as Utopian to anticipate a time when we may expect to cure disease by modifying directly the nutrition of the diseased part; but I must say that I do not regard this prospect as by any means hopeless. I may, indeed, give one example, in actual practice, of the application of the principle.

Paraplegia, or loss of power in the lower half of the body, may depend upon various causes. Shortly after the peculiar effects of nux vomica and strychnia in stimulating muscular action had become known, they were introduced as therapeutic agents in various forms of paralysis, and among others, in paraplegia. The mode of action of the drugs was not known, and it was soon found that while some cases improved under their use, others were not beneficially affected, or became worse. Experiment has, however, shown that strychnia acts by producing, through the vaso-motor nerves, paralysis of the walls of the bloodvessels, which consequently yield to the pressure of the blood, become dilated, convey more blood to the spinal cord, with the effect of exaggerating its nutrition, and thereby exalting its reflex property. Accordingly, in cases where paraplegia depends upon an inflamed or congested condition of the cord—that is, in conditions where there is already an excess of blood—it is found that strychnia aggravates the existing paralysis. On the other hand, we have in ergot of rye a substance which produces the opposite effect upon the bloodvessels. We know that ergot acts upon the uterus, causing powerful contraction of its non-striated muscular tissue. In like manner, it produces an exciting or stimulating effect upon the muscular walls of the bloodvessels, causing them to contract, thereby diminishing their calibre, with the effect of limiting the supply of blood to the cord. And we find in practice that in cases where paraplegia depends upon the presence of an excess of blood in the nervous centre, ergot of rye may be given with the best effects, while strychnia would only have acted in aggravating the malady. These, Gentlemen, are not theoretical

statements,—they are well-recognised therapeutic results. This example also illustrates the absolute necessity for a sound pathology and an accurate diagnosis to guide us in our choice of therapeutic agents. Unless we are thoroughly acquainted with the various morbid changes which may affect the different organs of the body, and unless we are able by an analysis of symptoms to determine on what special morbid action the symptoms depend, our treatment must often be worse than useless. This is especially true regarding the specific treatment of which I have been speaking; for just in proportion to its advantages when judiciously applied must be its dangers when abused.

I think it is probable that if the system which I have been endeavouring to describe be ever carried out, our most valuable remedies will be found to be those which act through the nervous system. All the most recent observations and experiments go to show, that the nervous system exercises a most important influence on nutrition both in health and disease; and as our object should be to attack disease in its very earliest manifestations, it must be through the nervous system that we should endeavour to influence the nutrition of the part, before any serious organic lesion has been established.

It will naturally be asked, how we are to attain to a knowledge of the specific properties of medicines, and of the circumstances in which they will be useful. My answer is, by *experiment*. And it must be borne in mind that it is not sufficient that we are acquainted with the physiological effect of a medicine, that is to say, with its effect on the healthy, it is essential that we become familiar with its action in disease. Strange as it may seem, some violent poisons act less readily on sick than on healthy animals. If equal quantities of cyanide of mercury be introduced into the stomach of a healthy dog, and of a dog weakened by disease, the healthy animal will be killed almost immediately, while the other will live for a considerable time. The reason is, that in the healthy animal the metallic cyanide has been decomposed by the acid of the gastric juice, and prussic acid has been set free; while in the stomach of the enfeebled animal there was such a deficiency of gastric juice that the decomposition could not take place, and death did not occur until the cyanide itself had been absorbed.[1] All medical men know how, in particular diseases, there is a marked tolerance or the reverse for certain substances; how, in cases of abdominal inflammation, what would ordinarily be poisonous doses of opium may be taken with impunity; while, in diseases of the kidney, a few grains of calomel may produce dangerous symptoms. Therefore it is that the real therapeutical experiments must be conducted by the clinical physician. The experimental physiologist may have demonstrated the action of a substance upon the healthy, but it is only at the bedside of the sick that those researches can be made which will teach us the *curative* powers of medicines. In this point of view, Hospitals

[1] Bernard, *loc. cit.*, p. 103.

have a peculiar value. It is chiefly from large institutions, where disease is seen on a great scale, and where the subjects of observation are placed under similar external circumstances, that important therapeutical results can be expected. The establishment of Hospitals has done much for the science and practice of Medicine, but it is perhaps in regard to Surgery that their value has been principally appreciated. Medical Pathology and Diagnosis have doubtless profited largely, but the therapeutical results have hitherto been comparatively inconsiderable. The value of well-conducted Hospitals is generally pretty well acknowledged by the public, and I feel sure that, even in a selfish point of view, their supporters will be amply repaid for their liberality. This form of charity is in an especial manner "twice blest;" not only is good done to those for whose benefit the institutions have been primarily established, but opportunities are given for the advancement of medical knowledge, the benefits resulting from which cannot fail to be experienced by the donors. In connexion with this subject, I gladly allude to the Royal Infirmary of Edinburgh, which has done so much to relieve suffering in this city, and indeed through all Scotland, and which has proved itself so invaluable an adjunct to our Medical School.

This institution has peculiar claims upon the public; though not, like many other Hospitals, richly endowed, and though to a great degree dependent on its annual subscriptions, it shows a liberality in the admission of patients unrivalled, I believe, in the kingdom. To obtain admission within its walls no Governor's order is required; disease and suffering constitute the only claim, and one which, so far as its accommodation permits, is never refused. The building, which has existed for a hundred and thirty years, is in some respects in arrear of modern requirements; but I am glad to know that there is a prospect of a new one being constructed; and I feel sure that the Managers may proceed boldly in the matter, confidently relying on the liberality of their fellow-citizens.

In bringing these observations to a conclusion, I have only a single remark to make. Therapeutics, in its future progress, may or may not follow the direction I have ventured to indicate, or it may advance by some other path; but of one thing I feel certain, Medicine is in itself too noble a pursuit, and its cultivators are a too devoted body, to allow us to entertain any doubt as to the ultimate result. It cannot be expected that Medicine shall ever take rank with the exact sciences, for where we have to deal with the phenomena of life, vitality introduces a disturbing element which we can never expect to overcome; but we may safely look forward to a period when we shall be enabled to undertake a more equal struggle with disease,—a period when the success of the physician shall be more nearly than at present on a level with his good intentions.

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